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Rose Technic

MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

NOVEMBER 1948

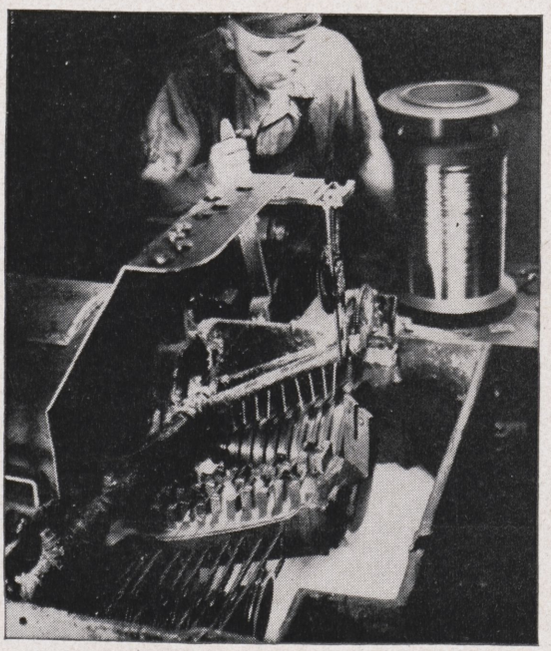
Highway Design

Automotive Suspension

SUPER TENSILE MUSIC WIRE PLATED WITH PURE GOLD...

developed by American Steel and Wire Company

Tenor banjo and tenor guitar players have long been plagued by unsatisfactory "A" or first strings. This string, when properly tuned, is under such high strain that most wires barely reach pitch. At the request of the Mapes Piano String Company, the Metallurgical Department of the Worcester Works of the American Steel and Wire Company, a subsidiary of United States Steel, created, after months of research, a wire specifically for this purpose. This new wire is made so strong that it possesses more than twice the tensile strength, in pounds per square inch, of cross sectional area, of the steel wire which American Steel and Wire spun into cables to suspend the 8¼ mile bridge across San Francisco Bay from San Francisco to Oakland, California. This makes the new string the strongest wire of its size of any kind known today.



This high quality super tensile wire is produced by a special combination of heat treatments and exceptionally long and exacting cold working. The result is a wire of 0.010 gauge with a tensile strength of approximately 460,000 pounds per square inch. One pound of this wire extends 3749 feet, or sufficient footage to pass from nut to bridge on approximately 1500 banjos or guitars. This unusual wire is then plated with pure gold in order to prevent rust and to impart beautiful appearance.

Opportunities

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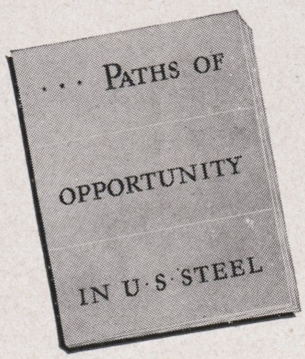

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Rose Technic

Volume LX, No. 4 November, 1948

In This Issue

FEATURES

FRONT COVER—Our Modern Highway System provides a means of rapid transportation to all parts of the country. The color plates were obtained through the courtesy of Bethlehem Steel Co.

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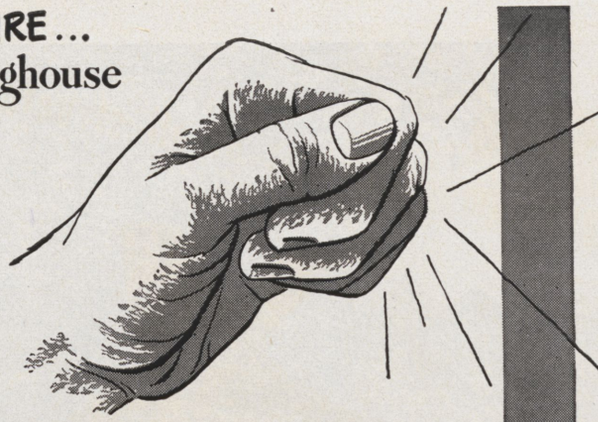

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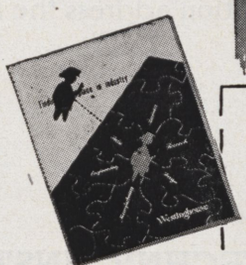

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Inevitable?

There has recently entered into the thinking of a vast majority of college students an attitude of utter defeatism concerning the economic future of the United States and the possibility of maintaining a state of real peace in the world.

The presence of this attitude in the best young minds threatens to subdue the ambition which normally activates them and thus to jeopardize the continued flow of new ideas and new methods for which society as well as industry has traditionally looked to the young college graduate.

Particularly to us, its present and future engineers, does Western Civilization look for technological advancement during these crucial times. Obviously, it must be we who shall keep America up to date in military production. Equally as important, it must be we who shall find ways of increasing the productive efficiency of the nation so that the result of four years of war production and subsequent sharing of our wealth with Europe will not have disastrous effects upon the American standard of living.

That standard of which we are so proud — justly proud — is already engaged in a rear-guard action. We may call it inflation, we may blame it on governmental interference with business, we may even accuse the trade unions of deliberately cutting production; but regardless of the immediate cause, the basic reason why a stenographer's $50 pay check today will not buy as many steaks as her $30 pay check could have bought ten years ago is that from 1940 to 1945 the productive capacity of the nation was dedicated to the making of "guns instead of butter". Now it is up to us to find ways for compensating for all the "butter" which was never produced.

There is still a more subtle side to this idea of inevitable war and tragedy. When a man believes something to be inevitable, he ceases to resist it. A fighter pilot shot down over the Pacific refused to accept death as inevitable and survived for 21 days to fight again; others, accepting their doom, perished in a day or two. To accept war with Russia or economic collapse as inevitable is to undermine mentally every physical effort we may make at maintaining peace and prosperity.

Along with every other thinking person, it is the engineer's duty to purge our minds of any trace of defeatism. We can study and work and believe—within our brains we hold the key to a prosperous world living in peace.

A. J. V.

Modern Design of Intersections Reduces the Accident Toll

Design of Modern Highways

By Sidney Zeid, sr., c.e.

With the invention of the wheel was born the science of Highway Engineering. For with the use of the wheel on vehicles of transportation, there arose the necessity of specially constructed trails, or roads, over which these vehicles could travel with greater ease. Later, with the increase in speeds, due to the inventions of the diesel and internal combustion engines, of automotive vehicles; better and well planned, designed, and constructed roads became a necessity. Thus, Highway Engineering became a more exact science. Today, in this fast and modern age in which we are living, the science of Highway Engineering produces an even more complex problem than ever before. The best answer produced, so far, to this question of high speed automobile travel with safety and convenience to the motorist, is the design of modern rural highways and expressway systems throughout the United States.

The problem of design of modern highways may be broken up into two parts: that of geometric design, which deals with the width and horizintal and vertical alignment of the road; and that of structural design, which relates to the weight-carrying ability of roadways. The predominant feature in each of these phases of modern highway design is safety, followed closely by costs. In both the determination of geometric and structural design three fundamental considerations are closely followed. They are: the number of vehicles to be accomodated during peak hours of traffic; the types of vehicles that will use the road; and the speed at which they may safely operate.

Geometric Design

First of all, we shall consider the problems involved in the geometric design of modern highways. The factors which determine the geometric design are location, number and width of lanes, sight distance, vehicle dimensions, horizontal curves, intersections, and grade separation structures.

Today, location of roads is largely a matter of relocating existing inadequate facilities, rather than creating entirely new routes. When choosing a location for an expressway, the essential requisite is to make a complete study of the present and future requirements of the area to be served, in order that the investment may be wisely made. Considered in this are the traffic patterns, types of vehicles, driver habits, and origin and destination studies. Many errors of location made in the past could have been avoided if engineers had been fortified with adequate traffic analysis data to define clearly the pur-

pose of the facility to be constructed.

It is also possible in many cases to improve the location of a road by taking full advantage of the terrain. For example, in widening a two-lane road to four lanes, the new section need not necessarily follow the grade and alignment of the existing pavement. By separating the two parts of the road, it may be possible to save on right-of-way costs and to increase safety by relieving the monotony of driving long distances on straight, level road. Terrain should be chosen, if possible, where minimum amount of excavation or borrow is involved in order to obtain a road of minimum degree of vertical and horizontal curvature.

Another consideration when choosing a new highway location is that of right-of-way. Right-of-way for all systems must be adequate for future widening when required, to preserve the investment, and to control movement on and off the highway. It is also necessary that locations on all routes be permanently established as rapidly as possible and right-of-way acquired far in advance of construction. Early acquisition often results in substantial financial savings.

Traffic lanes must be planned so that they are wide enough to provide lateral maneuvering space for all types of vehicles operating speeds for which a road is designed. For passenger car travel at normal operating speeds, 11-ft. lanes in rural areas are adequate. On rural roads carrying high percentage of commercial vehicles, 12-ft lanes are the accepted standard.

National standards for interstate systems prescribe 12-ft lanes where traffic density at the 30th highest hour of the year exceeds 200 vehicles per hour, with 11-ft for lesser volumes. For roads which are designed for speeds of 50 mph or more and volumes between 100 and 200 vehicles per hour, 11-ft lanes are recommended. Ten foot lanes may be used, although not recommended for modern highways, on roads expected to carry 100 vehicles or less per hour at speeds of less than 50 mph. National standards for interstate systems provide for design speeds ranging from 70 mph in level country to 50 mph in mountainous country. For all express ways and freeways 12-ft lanes are the accepted standard.

To determine the exact number of lanes, all elements of topography and potential use characteristics must be considered, but, in general, when the daily traffic averages 5,000 vehicles, a four-lane highway should be used. The modern trend is, when four-lanes are employed, to construct dual lane highways. This division of four-lane highways into two one-way pavements is justified on grounds of safety and increased flexibility and efficiency in movement of traffic. Dividing streams of traffic eliminates almost all head-on collisions; headlight glare is reduced by narrow dividing strips, and is almost eliminated when strips are wide.

The superiority of divided highways is particularly evident at grade intersections. Pedestrians and drivers crossing such roads need to watch traffic in only one direction at a time.

Another determining factor when considering widths of roads is the dimensions of the vehicles which will travel over it. Therefore, in many states the maximum widths of common carriers are limited by law. For interstate expressways it is recommended that 12-ft lane widths be provided to accomodate all legal-size vehicles. Heights of vehicles have also been standardized so that overpasses, underpasses and bridges will accomodate all legal-size vehicles.

Sight distance on all highways must be adequate for overtaking and passing vehicles and for safe stopping in emergencies. For a road with a design speed of 70 mph, the recommended standard for sight distance necessary for overtaking and passing is 2,600 ft. This distance is reduced to 600 feet for design speeds as low as 30 mph.

Sight distance for safe stopping is the number of feet between a vehicle and an obstruction in which the vehicle may be brought to a halt to avoid an accident. Recommended standards vary from 475 to 200 ft, depending upon the design speed of the road. These standards for sight

Continued On Page 16

Cut Courtesy Bethlehem Steel Company

Longitudinal and transverse contraction and expansion joints as employed in modern concrete highways.

Research and Development

By Dale Carey, soph.
and George Eddy, soph.

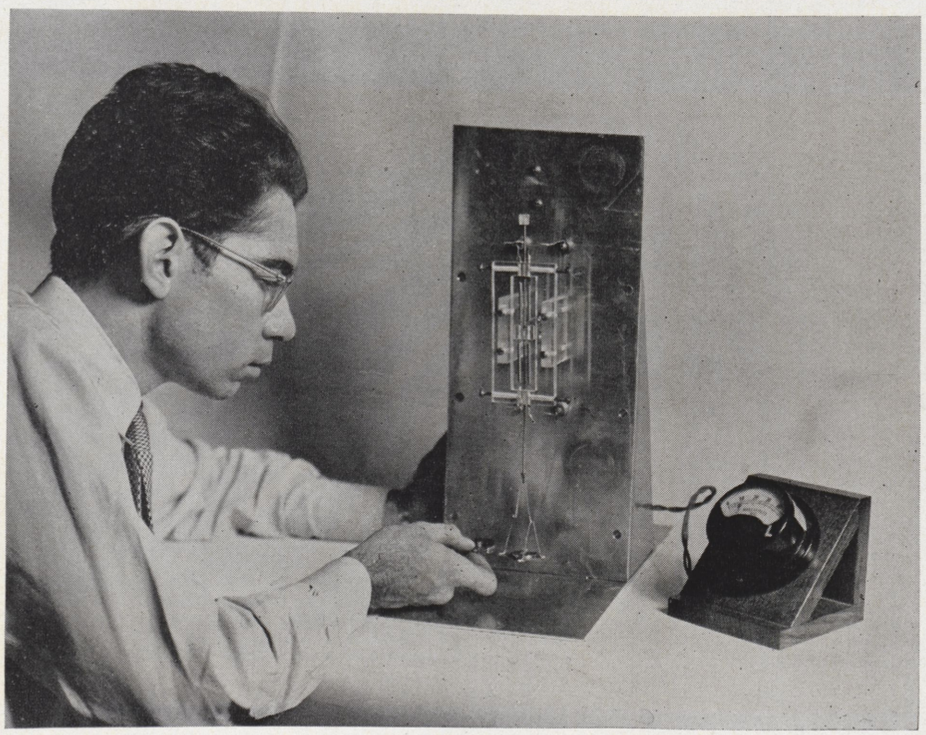
Variable-Resistance Spring Transducer

A highly sensitive mechano-electrical transducer, which transforms slight displacements into large changes of resistance, current or voltage, is now being developed by the National Bureau of Standards. The active element of the device is a helical or conical spring wound in such a way that the initial tension varies slightly along its length. Thus, when the ends of the spring are pulled apart, the turns separate one by one rather than simultaneously.

When the spring is entirely closed, it has an electrical resistance approximately that of a cylindrical tbue. When it is completely open, its resistance is that of the total length of the coiled wire. Resistance can thus be varied over a wide range by stretching the spring. As the percentage change in resistance may be hundreds of times greater than the percentage change in length, displacements as small as 1/100,000 of an inch can be easily measured without the use of electrical amplifying devices. The spring transducer thus provides a sensitive means for conversion of any mechanical displacement to a change in an electrical quantity that can be precisely determined. When connected to another transducer which gives a mechanical displacement output (a bimetallic strip responding to temperature changes, for example), the combination gives an easily measurable electrical output. This type of use suggests numerous scientific and industrial applications, including strain gages, pressure elements, accelerometers, electric weighing devices, automatic temperature controls, dc-ac inverters, and voltage regulators.

The preferable construction for the transducer is a four-arm bridge of which each arm is a variable-resistance spring. An increase in applied tension elongates one pair of springs and shortens the other pair.. The resistive unbalance of the bridge, as indicated by a galvonometer, thus gives a measure of the displacement that has occured. With this arrangement, since the voltage can be nearly reversed through the bridge, the output voltage can be theoretically twice the input voltage.

The variation of the initial tension of the spring along its length may be accomplished in several ways: by conical winding, by varying the angle of feed of the wire on a uniform mandrel, or by varying its tension as it is wound. For greatest sensitivity the variation in initial tension is made quite small. To decrease contact resistance between successive turns of the closed spring, a high average initial tension is built into the spring, and the turns are coated with 0.0001 inch of gold. Thus far, nickel-alloy wire has been mainly used, because of its high resistivity and small change of mechanical properties with temperature.



Spring Type Tranducer In Operation.

New Welding Electrodes

A new type of manual-arc welding electrode has been designed to improve weld quality as well as to lower welding costs.

These new electrodes, available in lime ferritic, iron oxide, and organic types, have a special type of coating and offer certain definite advantages. Training time for inexperienced welders is shortened and less expensive quality control is required. High deposition rates and efficiencies result in lower costs per foot of weld joint. Operator fatigue is reduced and a higher production rate per unit of time is obtainable. These new-type Norelco contact welding electrodes, two of which can also be used on a semi-automatic basis, permit touch-welding in all welding positions except vertical up and have automatic starting and re-igniting properties. They deposit weld metal of the highest mechanical properties and have deposition rates from 25% to 100% higher than those of standard-type electrodes.

These electrodes offer high deposition efficiency because of their low spatter losses and special coating. The special type of penetration obtained considerably decreases the possibility of undercutting. Standard size joints can be made with fewer layers, as

more weld metal per pass is obtainable.

The electrodes work satisfactorily with standard welding equipment on AC or DC, reverse or straight polarity. Very high currents, up to 600 amperes for the 5/16" size, may be used.

America's Foggiest Airfield to Test Krypton Approach Lights

America's foggiest airfield, in Arcata, California, is soon to be equipped with an all-weather approach lighting system which will be visible to pilots in heaviest fogs for at least 1,000 feet. The most brilliant of the lamps will contain the rare gas from the atmosphere known as krypton.

The system will include 36 of these world's brightest lights, and 35 lights of somewhat lesser brilliancy. Lined up in a row two-thirds of a mile long, the 71 lights will produce lightning-like flashes to guide fogbound pilots to the runway.

The 36 krypton flash units will be placed in line alternately with 35 neon units. When flashed from one to another in the wink of an eye, the lights will appear like a flash of lightning to a pilot in the air.

Krypton lamps use this gas instead of the argon formerly used. It can be obtained by the distillation of liquid air. Krypton gas gives a greater brilliancy than argon or neon. Those to be used here are four-inch long, slender, quartz tubes filled with the gas, and have a peak capacity of 3,300,000,000 candlepower each.

Conventional Plus Jet Power Feature Carrier Plane

Conventional engines plus jet propulsion feature in a new Navy plane designed for carrier operations. Two reciprocating engines are located under its wings, and a turbo-jet engine is in the tail of the fuselage.

In normal operations, the conventional engines will be used. When added speed is needed, the jet can be cut in. The reciprocating engines are Pratt and Whitney Wasp Majors, and the jet is a GE-Allison turbo-jet.

This new plane, which has already completed initial flight tests, will be known as the XAJ-1. It carries a crew of three, has tricycle landing gear, high wing, and four-bladed propellers. Outer wing panels fold inboard and the vertical tail folds onto the right surface of the horizontal tail.

This plane will be considerably faster and able to carry a heavier bomb load than present carrier types.

Airborne Magnetometer Detects Oil Formations Under Water

The magnetometer is a device housed in a bomblike structure which is trailed behind and below an airplane. Its delicate magnetic instruments react to magnetic influences below, even to a submarine concealed deep in the ocean. It was used during the war, and since, to locate hidden iron ore deposits. Its greatest use today is in the search for petroleum, even oil under swamps and in the ocean bed.

It has already been used in many surveys for oil, including an 85,000-square-mile area of the continental shelf in the region of the Bahama islands where other scientists, working under giant diving bells, used gravity methods. The magnetometer method is now being used to explore a great tract in Africa with American planes and American instruments. Many other surveys have been made over dry land and almost inaccessible swamps. One great value of the magnetometer is its ability to survey hard-to-get-at areas, and do it with great speed.

The magnetometer reacts to the earth's magnetism, in addition to iron and steel objects and to deposits of magnetic ore. It is a well-known fact that the earth's magnetic field varies in intensity. The variations of importance in oil explorations are those caused by differences in composition and proximity to the surface of the magnetic igneous rocks which comprise the underlying or basement rock found in all areas.

When the structural configuration, or form, of these basement rocks is such as to bring them relatively close to the surface, a magnetically high area will be indicated by the instruments. Thus, by the variations in these magnetic measurements, the geophysicists secure information which permits them to make a contour map, which shows variations in the composition and structure of the earth's basement rock.

The overlying sedimentary rock may reflect a similar configuration, which can indicate the existence of geological conditions permitting the accumulation of oil.

The heart of the magnetometer is a magnetically sensitive element about the size of a cigarette. Its findings are transmitted to the instrument in the plane through the trailing cable. The airborne magnetometer's success is due in large part to its ability automatically to orient itself at all times so that it is in perfect alignment with the earth's magnetic field.

New Injection for Gas Boosts Auto's Power

An alcohol-water injection for the gasoline in a car's engine, adapted from the wartime anti-detonant injection used in American warplanes, may give motorists more power and less "knock" on hills.

The injection fluid, called Vitol, and an auxiliary carburetor, the Vitameter, may mean a saving in fuel supplies as well as improved car performance.

Using the booster fluid has the effect of raising the gasoline's octane rating by 10 to 20 numbers.

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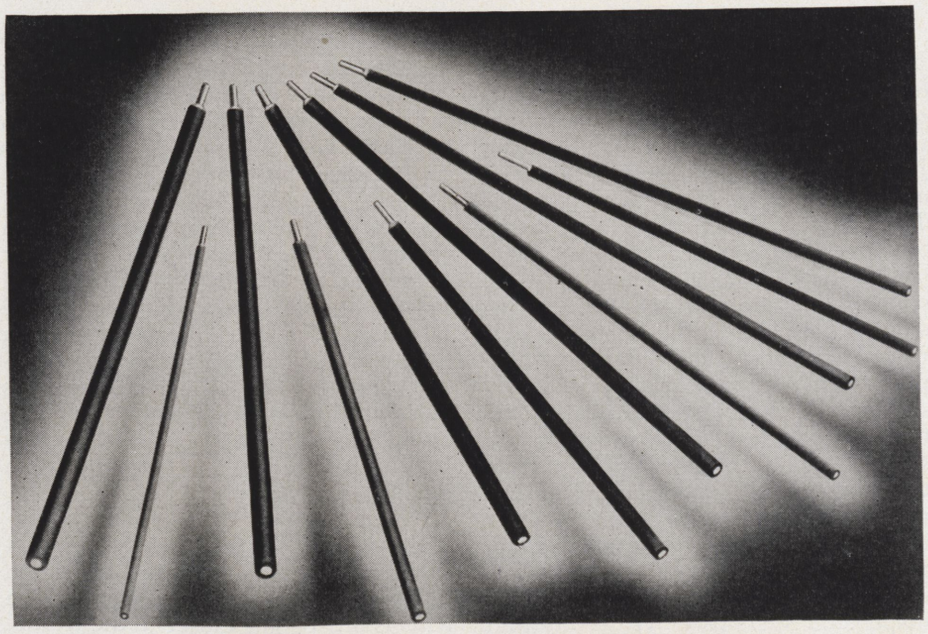
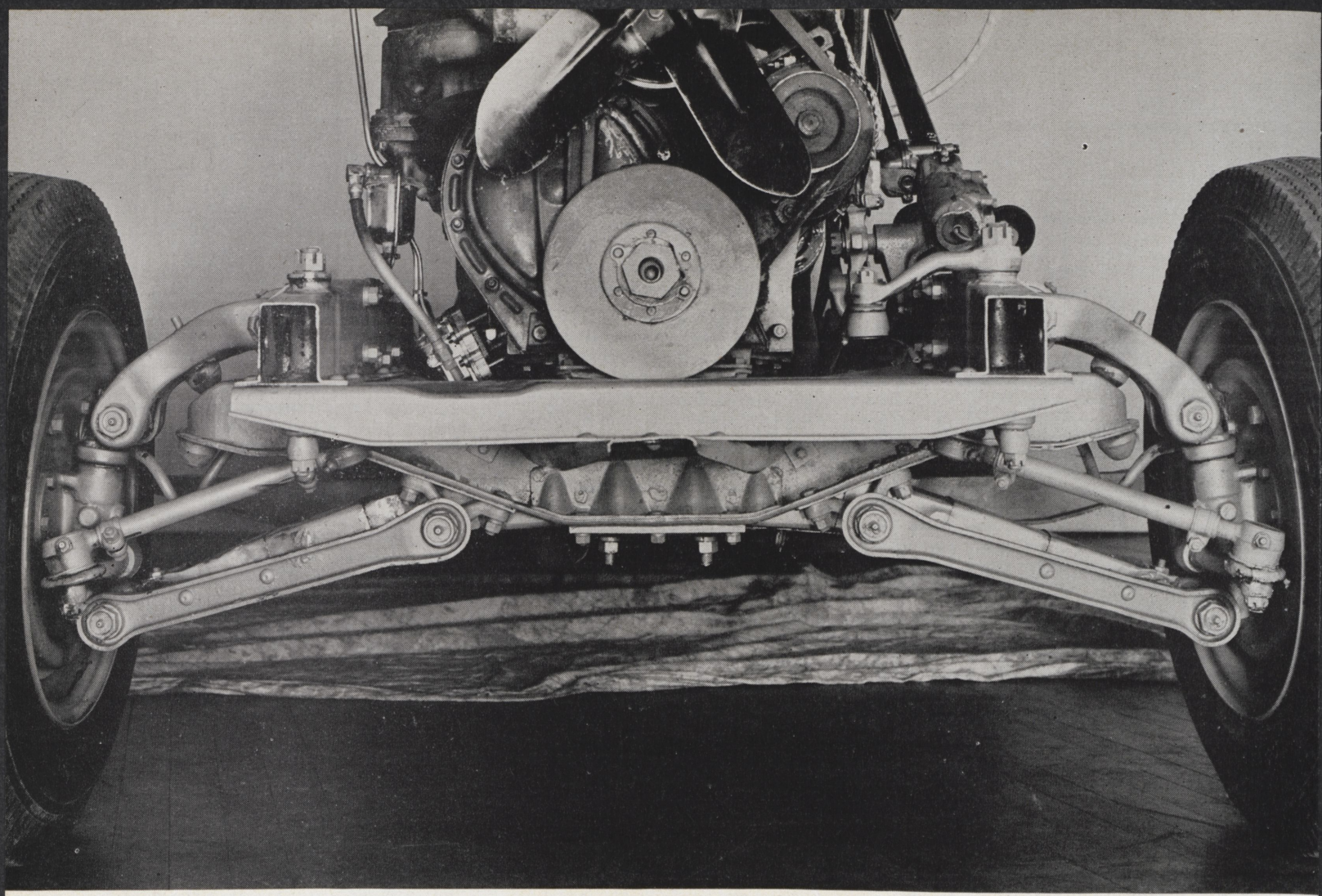


Welding Rods with New Type Coating.



Striped Down Automobile Showing Front Suspension System.

Automotive Suspension

By F. Allen Schmidt, sr., m.e.

The author wishes to thank Studebaker Corp., of South Bend, Indiana, for their generosity in supplying much of the information used in the following discussion, as well as for their friendly cooperation. Appreciation is also due Shanks Motor Company, of Terre Haute, Indiana, for the opportunities extended to the author.

One of the most outstanding achievements in automotive design since the advent of the horseless carriage has been the continual improvement of riding quality and body stability. It might truthfully be said that the greatest contribution to the smooth ride in today's motorcars is the pneumatic tire rather than the suspension system, for certainly there is a greater difference between modern rubber tires and the old steel wagon tire than there is between the suspension systems of yesterday and today.

However, the present ideas incorporated in suspension design are worthy of consideration to the engineering enthusiast. Basically, a suspension mechanism is that system of parts which connects the wheels and axles to the main frame or chassis, the desired function being that, while the wheels follow a rough contour of the road, frame and body travel in a straight line, unaffected by the up-and-down bobbing of the wheels. If the wheel assembly is the only part of the car to undergo vertical motion while the body remains in nearly the same horizontal plane at all times, then there must be extremely variable motion between wheels and frame.

When the car rolls over a depression in the road the wheels must separate from the frame; and when it rolls over a raised portion the wheels must come closer to the frame. At the present state of development in suspension systems, part of this axle motion will be transmitted to the body. If only the right front and rear wheels, say, experience the road shock, a torsional vibration will be set up about the longitudinal axis. Similarly, at the moment both front wheels experience a road shock the front end of the car will be raised (or lowered, as the case may be) higher or lower than the rear, resulting in a momentary torsional vibration about the lateral axis. The sidewise rocking is called *roll*, and the endwise rocking is called *pitch*. Further linkage of some sort in addition to springs and control arms is often incorporated in suspension design to counter-act these undesirable effects. With the growing use of coil springs, this instability is often more pronounced than with the classical leaf spring.

One make of car which still includes the forward leaf spring is the Studebaker, on all models. Perhaps a

more comfortable ride might result from use of the coil as far as up-and-down translation is concerned, but stability is sacrificed, and a stabilizer becomes necessary at additional expense. In the 1948 model Studebaker, rotary-type rear shock absorbers are mounted with activating arms extending toward the center of the car, with the plane of their rotation *perpendicular* to the longitudinal axis of the car. This arrangement differs from some previous models, which mounted rear shock absorbers so that the plane of the activating arm was parallel to the axis of the car. The present system helps to stabilize roll of the body by hydraulic action only, rather than by a combination of very light hydraulic action and undesirable strain.

The vibration system of the conventional automobile suspension is an exceedingly complicated one. One *degree of freedom* is said to prevail if one deflection distance will exactly define the given system and all of its forces (provided spring constants, etc., are known). In the case of the motorcar there are three separate and distinct masses: the body, the front axle, and the rear axle. There are eight distinct springs: the four main springs proper and the four tires. Each body or mass may have the following motion: (1) *rolling* about the longitudinal avis, (2) *pitching* about the lateral axis, (3) *nosing* or *yawing* about a vertical axis, (4) *vertical translation,* (5) endwise *horizontal translation,* and (6) sidewise *horizontal translation.* Since there are three different bodies, there are 18 degrees of freedom. To rationally analyze this system for discussion would require considerable mathematical proficiency.

For this reason, we shall consider only one degree of freedom with forced vibration and damping. It seems fitting that we should choose as our example the product of Studebaker Corporation, of South Bend, Indiana. Every year for ninety-eight years Studebaker has suspended a frame from the four wheels of whatever the current vehicle may have been—from horse-drawn wagons to the modern motorcar. Today sound engineering convictions are upheld in several instances at Studebaker where the objective viewpoint may hold both pro and con arguments. The front leaf spring is such an instance, and will be considered later.

In developing the equation of motion for either the front or rear automotive suspension systems it seems permissible to assume a simple linear vibration system in both cases, even though the front system is a torsional one with the centers of rotation at the bearings where upper and lower control arms are joined to the frame. The weight supported by each wheel is applied at a point on the lower control arm not quite as far out as the kingpin, while the damping force from the shock absorber is applied to the upper control arm hardly more than half-way out to the kingpin. However, both spring and damping forces may be thought of as applied at opposite ends of the kingpin for the purpose of our discussion. For, in reality, there is an *equivalent system* the linear forces of which (applied in the same straight line) will cause the same behavior as that which does occur.

Between the suspended mass (body and frame) and the rigid ground, which will be assumed to include the kingpin, there is a spring of stiffness k (lbs/in). Parallel to the spring, between the same points, is a damper or shock absorber. This will transmit force to the mass only when it is in motion and in amount directly proportional to the velocity of motion. The force from the damper is $c \times x'$ (where x' is the first derivative of x with respect to time), and the damping constant c in lb-sec/inch. The damping constant naturally changes with temperature, since the shock absorber's fluid becomes more viscous when it is cold. In the discussion to follow w will denote forced angular velocity in radians per second, m the mass in lb-sec^2/inch, and t the time in seconds.

When the ground "moves" up and down with an amplitude of b, and its change of contour is determined by $b \sin wt$, this relative motion of the ground is completely equivalent to an *external force* acting on the car body. If the body displacement is x, then the *relative* motion y between the frame and axles is $x - b \sin wt$. The spring force is thus $k(x - b) \sin wt$, and the damping force is $c(x' - bw) \cos (wt.)$. The resulting differential equation of relative motion is:

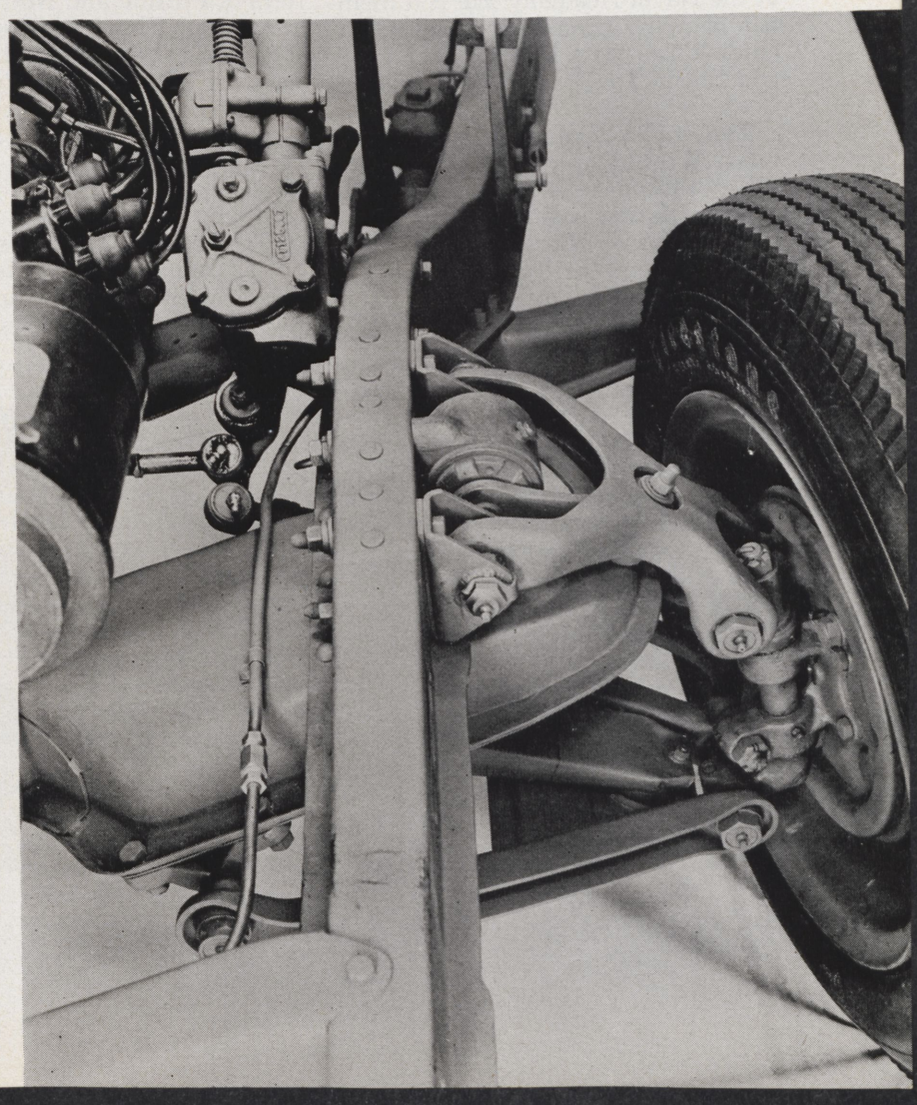
$$m\frac{d^2y}{dx^2} + c\frac{dy}{dx} + ky = mbw^2 \sin wt$$

Solving for maximum amplitude with respect to level ground the algebraic eqquation becomes:

$$x_0 = \frac{mbw^2}{\sqrt{(cw)^2 + (k - mw^0)^2}}$$

In this derivation the equation of motion is obtained for the absolute displacement x, and from the foregoing relation it is obtained in terms of the relative displacement y. It is important to remember that the spring effect of the tire is disregarded, the analysis of it being exactly

Continued On Page 22



Details of the Studebaker Suspension System.

Campus Survey

By Jayson Brentlinger

Rose Gets New Prexy

After several months of deliberation, the board of managers has finally announced that Mr. Ford L. Wilkison Jr. will be the next president of Rose Polytechnic Institute.

Mr. Wilkison comes to us from Annapolis, Maryland, where he has been serving as academic dean of the postgraduate school of the United States Naval Academy. Upon examination of Mr. Wilkison's record, there can be no doubt that he is an excellent choice for president of such an institution as Rose.

Originally from Kentucky, Mr. Wilkison received his early schooling at Georgia Tech, and the University of Georgia. He received his masters degree from Columbia University, and did additional work at the United States Naval Academy. He has served as dean of the Speed Scientific School, and on the faculty of the University of Tennessee, in addition to his work at the Naval Academy. He is a member of many prominent societies including Tau Beta Pi, Phi Kappa Phi, and Sigma Tau.

The students of Rose are looking forward to the first of the year, when Mr. Wilkison will come to Rose to assume his new position. In the meantime, Professor Wischmeyer will continue to serve as Temporary President as he had done since Dr. Prentice resigned.

Radio Club News

The next time you are going by the E.E. department take a look at the collection of QSL cards that the radio club hams have been collecting in recent weeks.

Radio Club activities in the past month consisted of a demonstration by Robert Smith on multi-element antennas, a continuation of his talk from the previous meeting.

ASCE Activities

The student chapter held its usual dinner meeting at the Fort Harrison Country Club, overlooking the Wabash River. Professor R. B. Wiley of the Civil Engineering Department of Purdue University was the principal speaker for the evening and he presented a long and interesting paper relating to the engineer as a citizen.

The student chapter is also planning a joint meeting with the Indiana Section ASCE and the student chapters of Purdue and Notre Dame Universities. This meeting will take place sometime during the early part of November. Various committees are working on the preparation for this project.

Football

They're off!! and it's Rose by a nose, coming into the far turn Rose leads by 6 and at the finish it's Rose by 12. The Fighting Engineers solid line held McKendree scoreless the entire game and yet they ripped open the "Iron Curtain" of the opponents while Harry Lucas carried the oval for both touchdowns.

In the second game of the season Rose was dropped by Canterbury 19-0. The Slipstick Kids fought hard but "Lady Luck" turned against them.

The third game brought the Scrappin' Engineers back eager to revenge the previous week. Although the score was 0-0, Rose appeared to have a T. K. O. over Franklin by having the greater number of first downs and by knocking at the opponent's door constantly. The fans witnessed an excellent runner for the Grizzlies in the person of Gallant. This speedy back proved to be a constant threat to the mighty Engineers.

This game was definite proof to the fans that the Rose Gridders are not to be taken lightly by their foes.

Junior Prom

The annual Junior Prom was held in the Marine Room of the Terre Haute House with Bill Oetzel and his orchestra "pounding it out" from the Mayflower Room. One of the main factors contributing to the success of the Junior Classes "brawl" was the "high class" entertainment furnished at intermission by the drummer. The Juniors are to be complimented for this excellent dance, and it is hoped by everyone that the ones in the future will be as burlesque.

Concluded On Page 30

This Man Runs His Own Interference.

With All Due Respect.

"Will this course help prepare me for a telephone job?"

"Yes, it will. And that would be true of almost any course you'd name.

"That's because varied abilities are required. The telephone system has mechanical engineers, electrical engineers, civil engineers, and so forth. Some are in development or research, and make contributions in these fields. More are in the operating end. They deal with economic as well as technical problems, handle personnel, and assume other responsibilities gained as their careers progress.

"In other words, telephony has many interesting jobs. To prepare for one of them, learn your particular branch of engineering and gain as much all-around knowledge as you can."

BELL TELEPHONE SYSTEM

Alumni News

By Edward Meagher, sr., ch.e.
and Mort Hief, soph.

Chester C. Stock

Dr. Chester C. Stock, son of Professor Orion L. Stock, who is head of the Engineering Drawing Department of Rose Polytechnic Institute, was awarded the Certificate of Merit by the direction of President Truman on September 28 in recognition of the outstanding service he rendered his country during World War II.

Dr. Stock was born at Terre Haute on May 19, 1910. He was graduated from Garfield High School, where he was editor of the yearbook. He graduated from Rose in 1932, having received the Heminway Medal in both his freshman and senior years. He was president of Tau Beta Pi and editor of the Modulus in his senior year, served on the Technic staff, the Student Council, and the Handbook Committee, and was president of the Sophomore Class and an honor man. He also was a member of Alpha Chi Sigma, the Polyphase Club, and the American Chemical Society.

After graduation, he married Grace Knipmeyer. They now live in New York City.

He obtained a doctorate in biochemistry at Johns Hopkins University in 1937, and in 1931, the master of science degree at New York University, where he served as an instructor in bacteriology in the College of Medicine for a number of years.

In 1943 Dr. Stock was a technician for the committee for treatment of gas casualties, National Research Council, and in 1945 served both as deputy chief of the division of chemistry, Committee on Medical Research of the Office of Scientific Research and Development, and as executive secretary, National Research Council, Committee on Insect Control.

In September, 1947, Dr. Stock addressed a meeting in St. Louis of the International Cancer Council, and later in that month conducted a one-day seminar on biochemical matters at the Commercial Solvents Corporation in Terre Haute. He is at present chief of the experimental chemotherapy division of the Sloan-Kettering Institute for Cancer Research.

The award recognized Dr. Stock's achievements as a member of the Office of Scientific Research and Development, although the precise nature of the achievements has not been disclosed. The certificate was presented at joint Army-Navy ceremonies on September 28 in New York City. Major General Julius Ochs and Rear Admiral Walter S. Delaney made the presentation.

Wilbur B. Shook and Grandson

Shown above are Wilbur B. Shook, of Indianapolis, Indiana, and his ten months old grandson, Billy Buschmann. Mr. Shook was a member of the class of 1911 and is at present vice-president of the Rose Polytechnic Alumni Association. Young Mr. Buschmann is a prospective member of the class of 1968.

'02 The alumni editor is indebted to Mr. M. W. Blair, '03, for the following item.

Mr. Howard H. Craver, a student in the class of 1902, died June 6, 1948. His major interest was in plastics and at the time of his death he was with the Pittsburgh Test Laboratory. Mr. Craver was a member of the American Ceramic Society.

'18 Mr. Fred Springer formerly with the J. G. White Engineering Corporation in New York City, died last September.

CHANGING YOUR MAILING ADDRESS? FOR PROMPT SERVICE NOTIFY THE TECHNIC DIRECTLY-IN ADVANCE IF POSSIBLE.

'41 John R. Roberts was married to Miss Norma Von Oburu on Sunday, September 18 in Indianapolis, Indiana.

'43 Mr. and Mrs. Richard Driskell have announced the birth of their first child, Douglas Gall Driskell. Young Douglas, weighing in at seven pounds and fourteen ounces, was born August 29, 1948.

'46 Robert Penno and Miss Mary Helen Moeller were married last July 31 in Rhinelander, Wisconsin.

'48 William P. Woolsey is now a member of the engineering staff of Eli Lilly and Company in Indianapolis, Indiana.

CAREERS AT GENERAL ELECTRIC

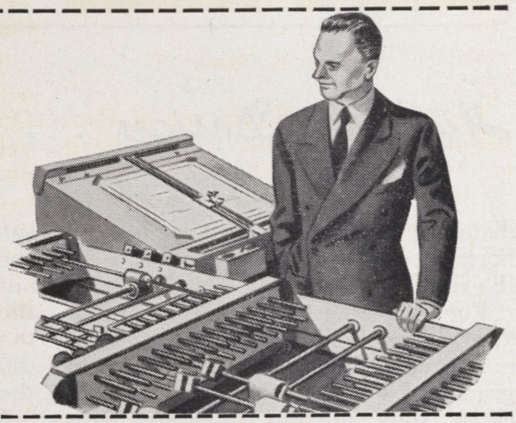
General Electric is not one business, but an organization of many businesses, offering opportunities in virtually all the professions. Here three G-E men brief the career-possibilities which the company offers to the technical graduate, the mechanical engineer, and the chemical engineer.

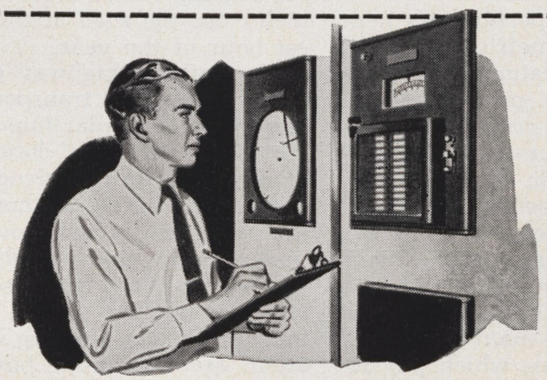
TECHNICAL SPECIALISTS: MEET YOUR HOST

M. M. Boring (Colorado), manager of the Technical Personnel Division: It's my job to contact young men with technical training who are interested in careers with General Electric, and to start them on their way up through our training programs. Opportunities for them were never greater. This year we have hired more electrical, mechanical, and chemical engineers, and more chemists, metallurgists and physicists, than ever before.

MECHANICAL ENGINEER

H. P. Kuehni, of the General Engineering and Consulting Laboratory: Much of my work has to do with such hurry-up calculating machines as the differential analyzer, the AC network analyzer, and the electronic digital computer. For the engineer with a bent toward mathematics, these machines are opening up exciting possibilities in many problems whose mathematical complexities, or sheer length, have heretofore discouraged investigation.





CHEMICAL ENGINEER

Gil Bahn (Columbia), graduate of the G-E Advanced Scientific Program: Graduation from this program poses an interesting problem to the chemical engineer. Which of the company's diverse fields of endeavor offers the greatest challenge and opportunity? My own choice was in plastics, particularly the complex processes used in manufacturing synthetic phenol. I'm convinced it's one of the most fascinating tasks a young chemical engineer could tackle.

For further information about a BUSINESS CAREER with General Electric, write Business Training Course, Schenectady, N. Y.—a career in TECHNICAL FIELDS, write Technical Personnel Division, Schenectady, N. Y.

GENERAL ELECTRIC

Highway Design . . . .

Continued From Page 7

distances produce limitations for the horizontal and vertical curvature of the road.

For interstate systems five percent grades are the general limit, with a maximum of six percent. Maximum grades of 5 percent are specified because they do not interfere with flexible operation of passenger cars. On horizontal curves provisions should be made to give a line of sight of at least 400 feet ahead.

Whenever a highway changes direction, a horizontal curve must be inserted in order to ease the change of direction with minimum loss of speed. For roads designed for speeds of 50 mph the curvature should never exceed six degrees, and for speeds of 70 mph the curvature should not exceed four degrees. The outer edges of the curve should always be superelevated, the amount of superelevation being an inverse function of the radius of the curve and a direct function of the square of the velocity. On high-speed curves a simple curve is not sufficient to adequately produce the desired transition with ease and safety. Therefore, these curves should be spiraled at the beginning and end. In mountainous country, these curve specifications are difficult to meet, but no matter what the conditions are, the curve should have the longest radius possible.

Still another important element pertaining the geometric design of highways is the treatment of intersections. About 40 percent of all highway accidents occur at intersections. Today, three types of intersections foremost in design exist. They are: (1) Intersections at grade, where one stream of traffic crosses another; (2) rotary intersections where vehicles converging at the point of crossing enter a traffic circle which merges with main flow; and (3) grade separations which physically divide opposing streams of traffic by means of underpasses and overpasses.

The type of intersection employed is determined on the basis of anticipated amounts and types of movement and degree of hazard involved at crossings. Provision must be made for adequate sight distance, protection and guidance of all turning movements and separation of vehicular and pedestrian travel. National standards recommended for the state expressway system provide for grade separations where 3,000 or more vehicles use the road at the 30th highest hour of the year.

The railroad-highway grade-crossing problem is a transportation subject of wide popular interest because accidents at such locations have pointed out the deficiencies of such a system. Therefore, these crossings are being replaced by overpasses or underpasses, and newly designed highways all call for these structures where warranted. There is no exact formula for determining when separations are warranted, but consideration must be given to accident records, accident potentials and evaluation of time losses.

The final consideration to be given to the geometric design of modern highways pertaining to truck performance. Truck performance studies

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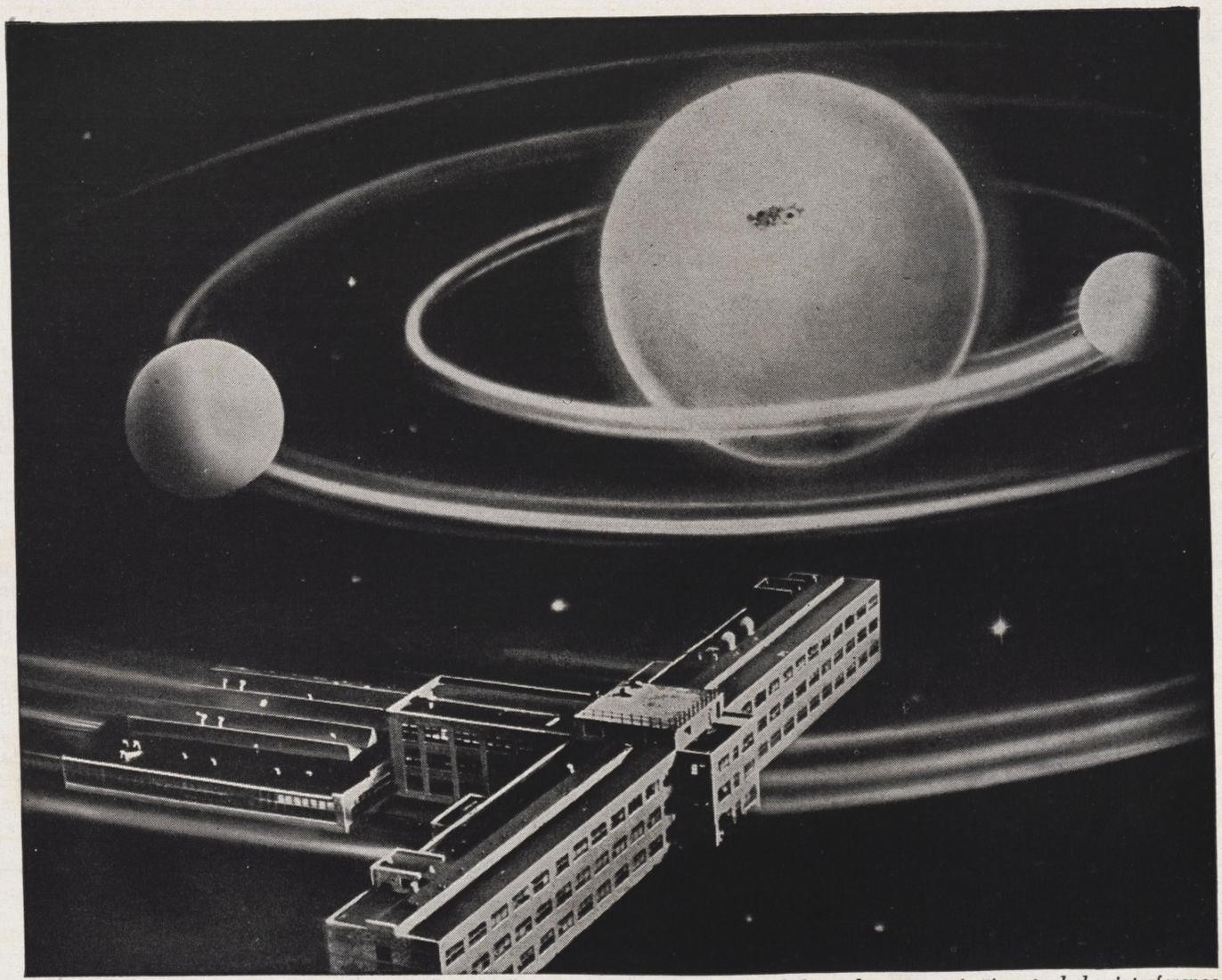

"Sunspot" research, by RCA engineers, helps radio communications to dodge interference from magnetic storms. RCA Laboratories is a center of radio and electronic research.

93,000,000 miles of laboratory space

A cyclonic spot erupts on the face of the sun, and—here on earth—we feel it. Sunspots cause "magnetic storms," which disrupt radio communications.

What can be done about it? Research, during which RCA scientists and engineers "worked" by instrument on the sun—93,000,000 miles away—offers an answer.

For years, science related magnetic storms to sunspots. Accurate forecasts of disturbances were needed.

RCA scientists took a new tack. They noted that interference was most intense when sunspots were in a certain "critical area." Location and activity were observed to be more important than size.

Using this knowledge, RCA communications engineers accurately forecast the beginning and end of magnetic storms. They have established a daily magnetic storm forecasting service which is distributed like weather reports throughout the world. Transmission of messages can be arranged over circuits or paths that will dodge interference.

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Also many opportunities for Mechanical and Chemical Engineers and Physicists.

RADIO CORPORATION of AMERICA

Continued From Page 16

have shown that operating conditions are best when maximum advantage is taken of truck momentum. Thus, short rolling grades permit trucks to operate with the least reduction in average speed. When sustained grades are necessary, the effect on truck operation is the total amount of rise to be accomplished. There is relatively little difference in truck operation as far as average speed is concerned, whether the grade is four percent or six percent. The truck must shift to a lower gear in either case, and there is no decided advantage in engineers attempting to reduce a grade from five percent to four percent to benefit trucks.

For safety and protection of all vehicles at intersections, it is necessary that the radii of turning lanes be great enough to accomodate trucks. On divided highways and at grade separations, increased facilities are necessary to permit longer vehicles to turn easily and safely. The proportional outlay involved in these added facilities is undetermined and is dependent upon existing conditions.

Structural Design

Highway pavements may be of two types, the flexible or rigid type. In a flexible pavement the support of the load comes principally from the subgrade soil and supporting material under a relatively thin wearing surface of bituminous material, while a rigid pavement consists of a thicker slab of material such as portland cement concrete. Pavement type is primarily determined by the quality of the available supporting subgrade materials.

Highway bridge design loading is controlled by the total weight of vehicle loads as well as the number, spacing and frequency of axle loads. Bridges are classified in general as H-10, H-15, H-20 and H20-S16 loadings. These designations are based on conditions brought about by groups of vehicles crossing a bridge in a single lane. For example, the H-20 design assumes a train of vehicles consisting of one 20 ton truck preceded and followed at normal spacing by 15 ton trucks. H-10 design assumes a 10-ton truck preceded and followed by 7½ ton trucks, and H20-S16 design would accommodate a 20-ton truck and 16-ton trailer followed by correspondingly lighter vehicles.

Standards for the interstate system provide for H20-S16 bridge design, and this standard should be used on all expressway systems and all other routes expected to carry maximum legal loads. Other roads require designs comparable to anticipated loadings.

In a proposed expressway system, design standards must be high enough to accomodate all types of vehicles that will constitute the traffic over the system. It is contemplated that trucks will be operated on all units of the expressway system, and buses on most routes. It is essential that bus routes be determined before expressways are designed, because special provision must be made for the safety of bus passengers and

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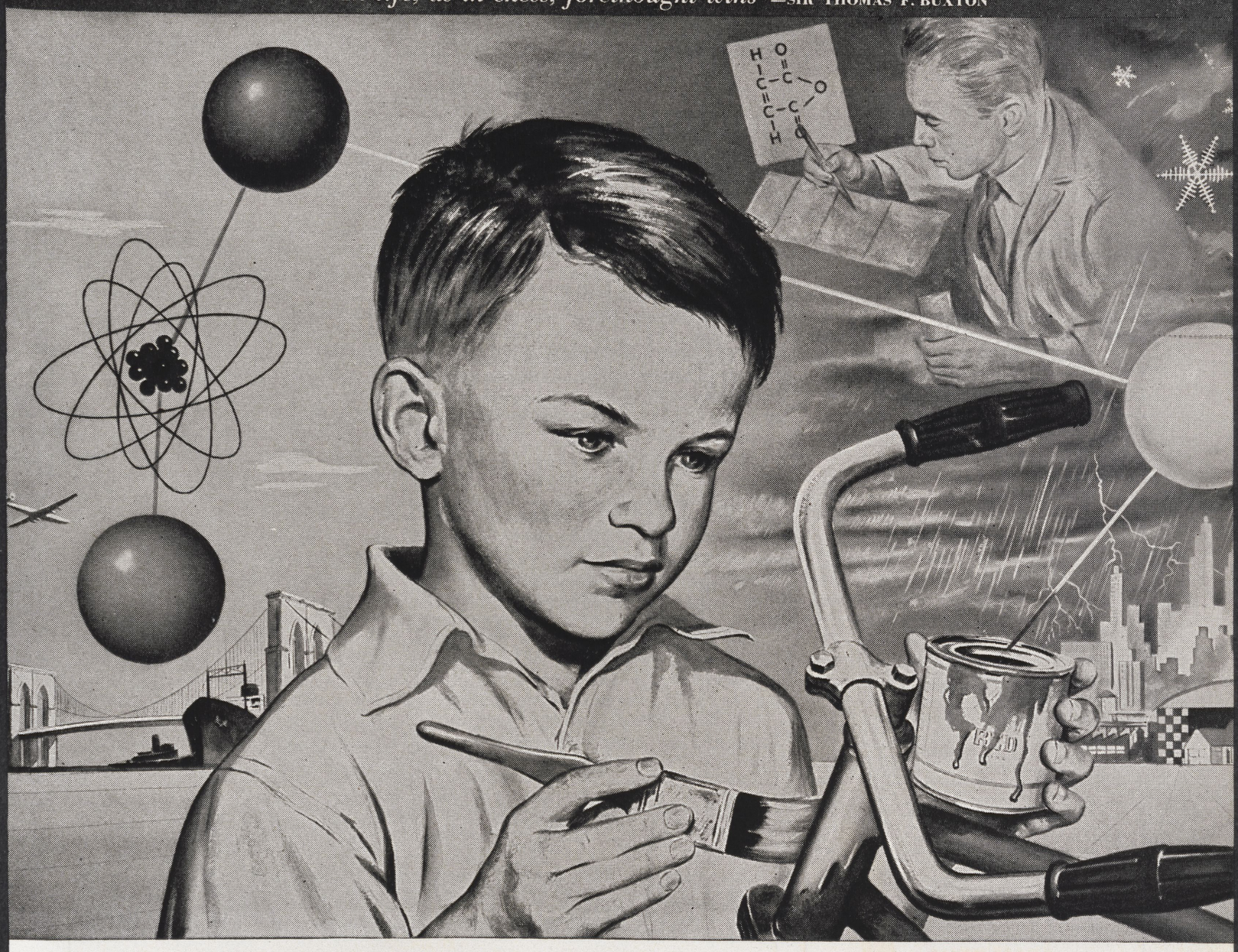
"—In life, as in chess, forethought wins"—SIR THOMAS F. BUXTON



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Concluded From Page 18

general traffic, with facilities for loading and unloading passengers outside the traffic lanes. Such facilities must be designed into the system because of the impracticability of adding them after the highway is constructed.

As has been stated, one of the most important items to be considered in the structural design of pavements is motor vehicle loads. The load carried on a single axle is limited to 18,000 lb by national standards, with a maximum of 32,000 lb for dual axles spaced less than 8 ft apart. The thickness of the slab to be used, and the type of reenforcing and spacing of the transverse joints, in case of concrete pavements, are determined by motor vehicle loads.

Having thus considered the major elements of road design standards, it is now easier to understand the complexity of the engineering problem involved in highway construction and the use of public funds in building safety and service into road facilities for the motorist.

Highways Can Be Beautiful As Well As Functional

DU PONT Digest
For Students of Science and Engineering

They said, "You can't do it!"

But Du Pont scientists developed a synthetic rubber with superior properties

"Synthetic rubber is an impossibility at any price!" declared a noted European scientist a number of years ago. And most people were inclined to agree because for more than a century chemists had been unable to duplicate natural rubber.

Du Pont scientists knew that all rubber had bad qualities as well as good. "Why struggle to duplicate its faults?" they asked. "Why not find a new chemical compound with all the good qualities of rubber, but none of the bad?"

They took as their starting point a discovery by Dr. J. A. Nieuwland of Notre Dame in connection with the polymerization of acetylene. By modifying this process, they made monovinyl acetylene. Adding hydrogen chloride, they made a new chemical compound called chloroprene—a thin, clear liquid at low temperatures. Like isoprene, it polymerized to form a rubber-like substance. But the new material, now known as *neoprene*, required no sulfur for vulcanization and was superior to rubber under many service conditions.

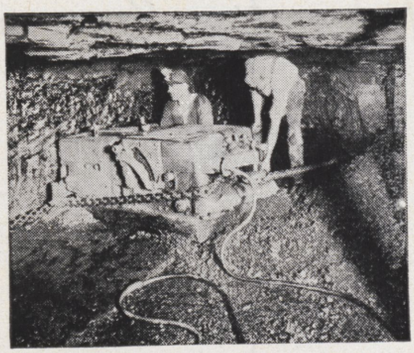
Today neoprene production is measured in millions of pounds a year, even though it is priced higher than natural rubber. Hardly an industry is not now using it, for such good reasons as these: neoprene products resist deterioration by oils and greases. They stand up under exposure to direct sunlight. Their aging and flame-retarding properties also are superior to those of rubber.

Three types of Du Pont research

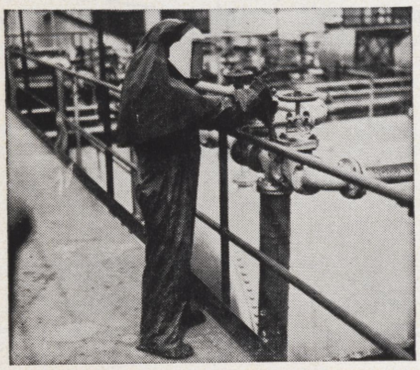
Modern research involves time, money, manpower. To develop neoprene, for example, took six years of laboratory study, a research and development expenditure of millions of dollars, plus the work of skilled research chemists, physicists, engineers, and other scientists.

At Du Pont, research is continuous. Some of it is designed to develop new products or processes; some to improve existing products or processes; and the balance is fundamental research to uncover basic facts without regard to immediate commercial use. Each of ten manufacturing departments has its own research staff and is operated much like a separate company. In addition, the Chemical and Engineering Departments, which are not engaged in manufacturing operations, conduct research in the interests of the Company as a whole.

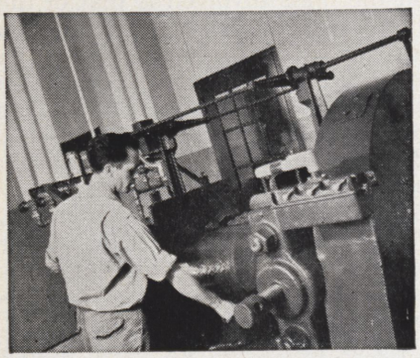
A typical Du Pont research team may include physicists, chemists, chemical and mechanical engineers, each of whom brings specialized training to bear on a specific phase of the subject. The man who joins one of these teams finds himself associated with some of the ablest minds in the profession and receives the opportunity and friendly support needed to make fullest use of his capabilities.



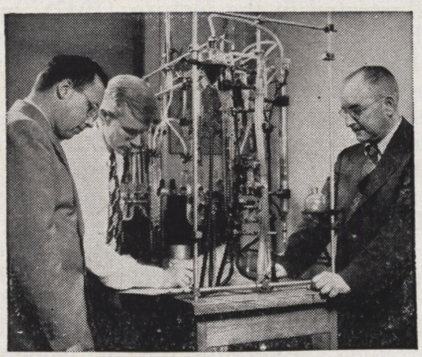
Neoprene, *used in wire, cable and hose jackets, resists abrasion, oil, heat, and sunlight.*



Neoprene gloves *and protective clothing resist deterioration by chemicals, greases and oils.*



Milling and compounding *neoprene in the rubber experimental laboratory.*



The new research man *has frequent contact with experienced supervisors. Here M. Hayek, Ph. D., Indiana '47, discusses data obtained in an experiment with F. B. Downing, left, a member of research supervision, and M. B. Sturgis, a research group head.*

What you want to know about Du Pont and the College Graduate

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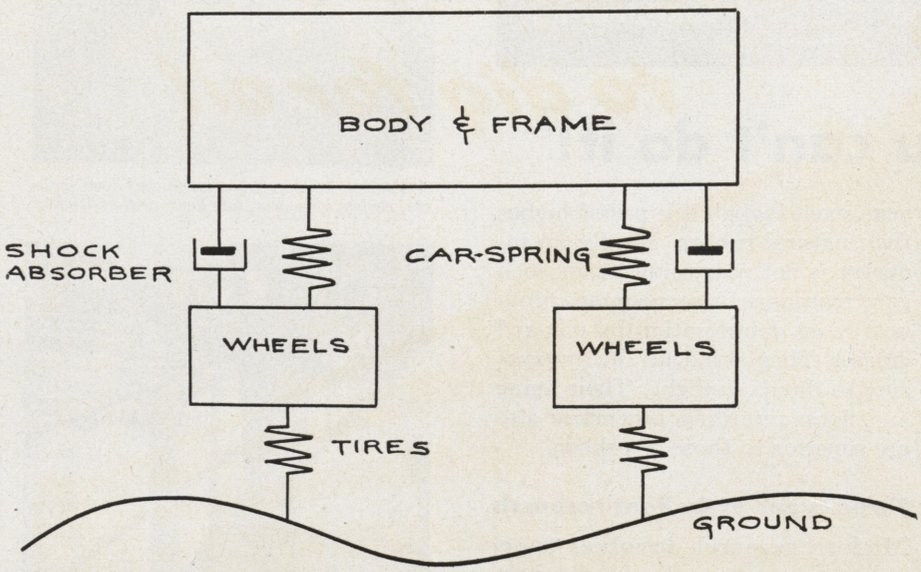

Equivalent Vibration System of an automobile.

the same as for the car spring except that the mass involved is that of the wheel and axle. The combined action then has two degrees of freedom. In the algebraic formula, x_0 may be found in the case of the Studebaker Commander by substitution of c = 3.24 lb-sec/in., k = 305 lbs per inch, the design forced vibration frequency 8.38 rad/sec (80 cycles per minute), and a mass of 5.12 lb-sec^2/in., all for the front suspension. Similarly, x_0 may betermined for the rear suspension using $k = 2 \times 100 = 200$ lbs/in., c = 7.64 lb-sec/in., the same design frequency, and a mass of 4.02 lb-sec$_0$/in. In both cases the damping constants must be doubled, for there are two shock absorbers; the other values may be substituted directly. This will give two different values of amplitude, which in turn can be used in such a way as to indicate the pitching effect.

The front suspension of the Studebaker automobile consists of a four-link mechanism called the Planar Suspension System. Its four links are: (1) upper control arm, (2) kingpin assembly, (3) lower control arm, and (4) the frame, or ground link. (See illustration). It is dampened by double-acting Houdaille-Hershey shock absorbers whose damping, like that in many makes of cars, is somewhat heavier when body and axle are spreading apart than it is when they are coming together. It might be said that the wheel should not be as free to drop from the frame into a road depression when there is the chance that it will bridge the gap and roll over it safely, and that certainly something must give way when the wheel rolls over a protrusion. But, in general, the theories of those manufacturers who make a practice of unequal damping on up-and-down motions have never been explained quite rationally.

One point of excellence in Planar Suspension is the great amount of wheel displacement possible with almost straight-line motion: about 8.25 inches. The change in axle camber or pitch between the two extremes of relative axle position is around 6 degrees. This angular change is kept as slight as it is by proper placement of the 7.75-inch upper control arm in conjunction with the 14.375-inch lower arm. In the 1948 model Studebakers, the spring is no longer bolted firmly to the lower control arm as illustrated in the picture (1947), but the hole in the end of the main leaf slips over a guide pin without securing. This design means that the spring is not called upon to act like a control arm, but it does what a spring should do — it exerts a force on a particular point in proportion to the displacement of that point.

The front suspension of the Studebaker Champion is designed for 70 vibrations per minute, which, with an 8.25-inch axle displacement, would produce a maximum vertical velocity at the center of the king pin of 181 inches per minute, assuming the displacement to be sinusoidal. This velocity would occur when the wheel is approximately in its static loaded position.

With a displacement of 14° above static position and 19° below, the lower control arm moves 34°, or 0.569 radians. Since the spring force is applied 12.375 inches from the center of rotation, the total distance through which the spring force acts in one cycle is: 12.375 x 0.569 = 7.05 inches. The average load upheld by the Champion model during maximum vibration amplitude is about 1427 lbs. Therefore the energy utilized in compressing the spring is 10,100 in-lbs. At 70 cycles per minute this amounts to a front spring loss of about 1.75 hp with maximum amplitude. It is important to remember that this is assuming *no body displacement;* however, if we had chosen a road contour of the proper (greater) amplitude, the *relative* displacement of axles with respect to frame would have been the full 8.25 inches. This matter is mentioned because very often we are inclined to forget that the spring suspension costs something; we don't get it for nothing, and the engine must supply the energy. In this absurdly impractical calculation, the energy used in moving the shock absorbers was ignored, as was the entire rear-wheel assembly.

The reason why a heavier car rides more smoothly than a lighter one is obviously due to the greater inertia force needed to accelerate the body and frame. When the car rolls over a depression in the road, the spring force between axle and frame forces the wheels into the depression. Immediately, there is less spring force acting upward than body weight acting downward, and the difference between these two forces is the force tending to produce body acceleration. Naturally, the greater the mass, the less the acceleration produced by this given, unbalanced force. A similar analysis is shown for a road protrusion.

However, this does not mean that riding comfort is directly proportional to mass, in spite of the truth that vertical acceleration is the measure of comfort. If a car weighs less, its unbalanced spring force will be less also. The Studebaker Champion model has very favorable riding quality at 2978 pounds weight — practically as smooth as the heavier

Continued On Page 24

This is where to dig for oil

No one has ever brought in a gusher in Whiting, Indiana—

—yet some of the greatest discoveries in petroleum history have been made in Whiting, and more will be made there. For at Whiting is Standard Oil's research laboratory, now housed in new buildings like the one above.

Standard Oil researchers, engineers, and other technical men have worked for years on the problems of getting more and better products from crude oil. Results to date are equivalent to the discovery in the laboratory of extra *billions* of barrels of petroleum.

Now Standard's men of science are looking beyond crude oil, as well as deeply into it. Already they know how to make liquid fuels and other products from natural gas and from coal, by variations of the hydrocarbon-synthesis process. The future will bring additional progress on possible replacements for petroleum and particularly on more effective methods of using our present supply.

A good share of that progress will be made in the Whiting laboratory. Standard Oil men of the present and future will continue to dig for oil in their own effective way.

Standard Oil Company

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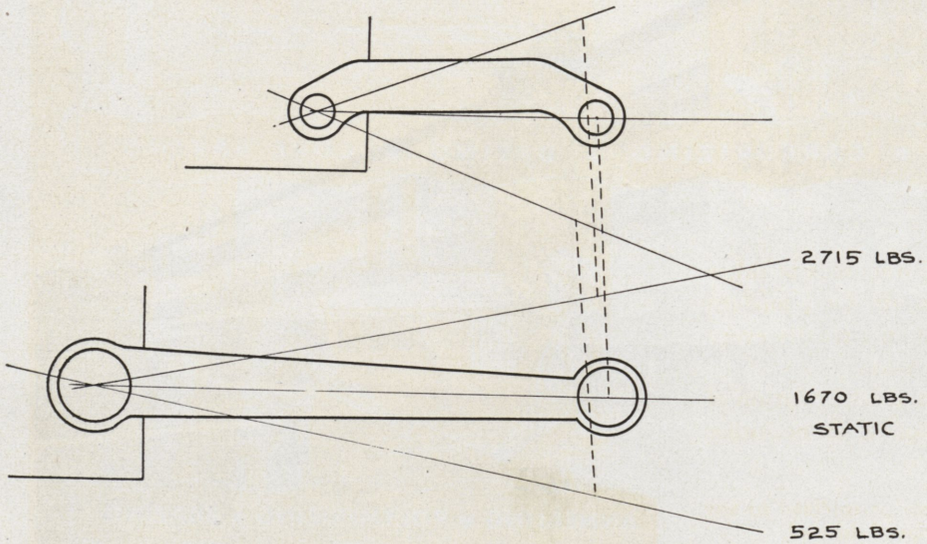
Continued From Page 22

Studebaker Commander model at 3449 pounds.

The final problem of riding quality depends upon eliminating the *vertical acceleration.* The "inertia controlled" shock absorber, which appeared in some makes of cars, was intended to deliver a force in opposition to body acceleration. In this respect there is some comparison with the Sperry gyroscopic pilot, and the idea seems reasonable. But when wheels and chassis are coming together with body acceleration upward, no such inertia damping is desired, and the same is true when wheels and body are separating with body acceleration downward.



Planar Suspension System.

The rubber tire has improved the ride, and at once its use should suggest a direction for improvement. That direction is *increasing the number of degrees of freedom.* Between each additional series spring there must be a mass, and if one more degree of freedom were placed between frame and axle, one additional mass would have to be included. Such a mass would have the objection of being wholly "dead weight." But in view of the research done on the inertia shock absorber, perhaps a simpler device might be developed whose damping force would be proportional to *acceleration* rather than to *velocity* as in the conventional shock absorber. This device would behave exactly as a mass as far as our purpose is concerned, and it would operate between the present spring and the additional one.

More practically, there is another

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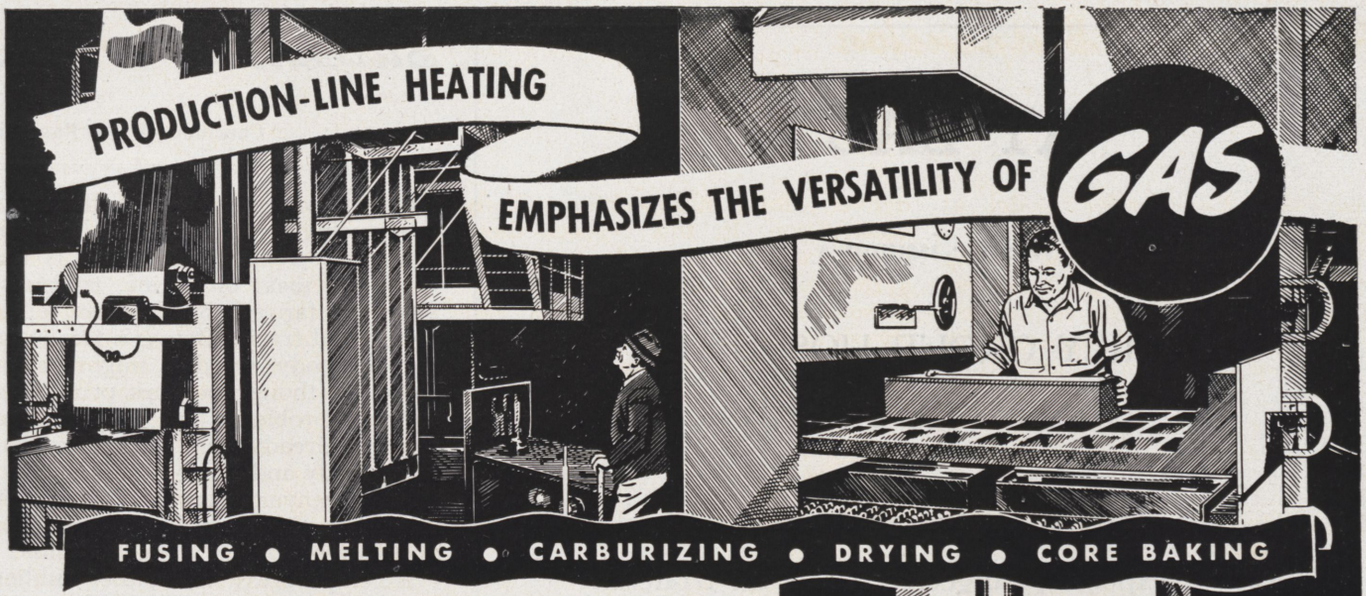

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As a source of heat in the production and fabrication of metals GAS combines characteristics found in no other available fuel—

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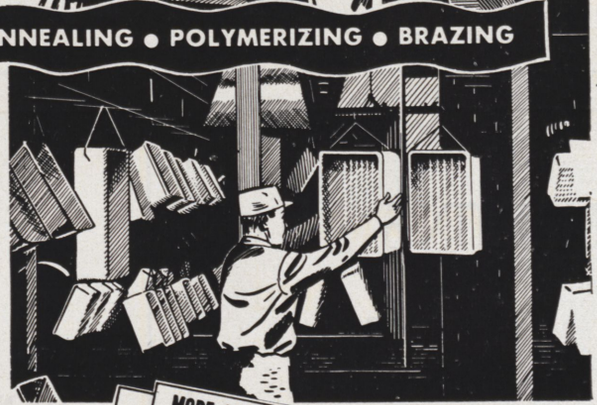
- **FLEXIBILITY**—equipment is applicable over a wide range, performs many heat-treating and processing operations without expensive accessory devices.
- **ECONOMY**—the fuel and the modern equipment are economical, the production cost per piece amazingly low.
- **CLEANLINESS**—clean fuel facilitates good "shop housekeeping," promotes morale and good health among workers, eliminates many causes of rejects.

These are the characteristics of GAS you'll find useful in any industrial heating application—these are the reasons why GAS is Universally accepted wherever heat is used for processing.



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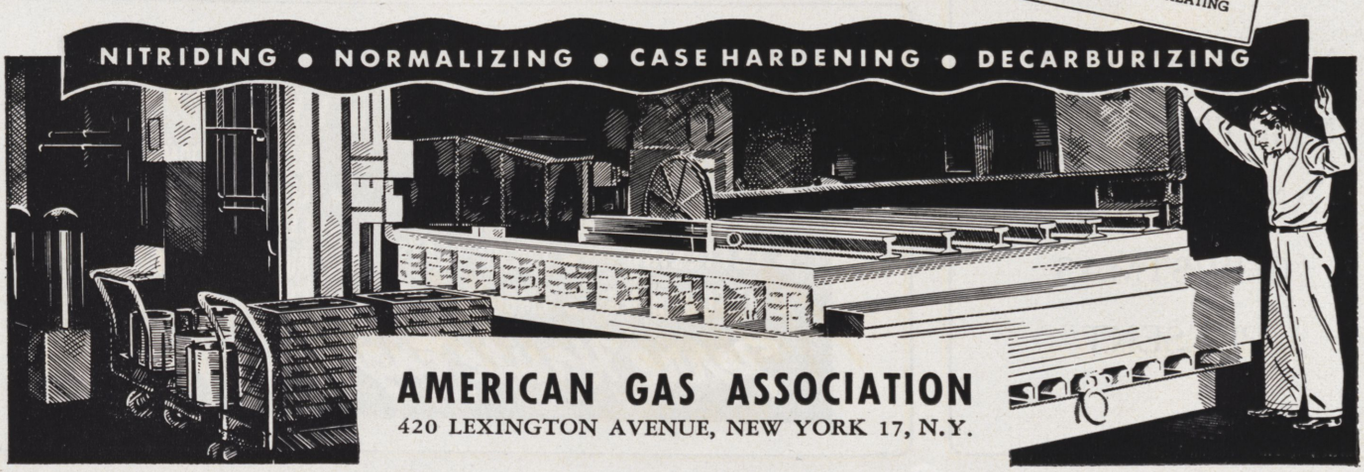


AMERICAN GAS ASSOCIATION

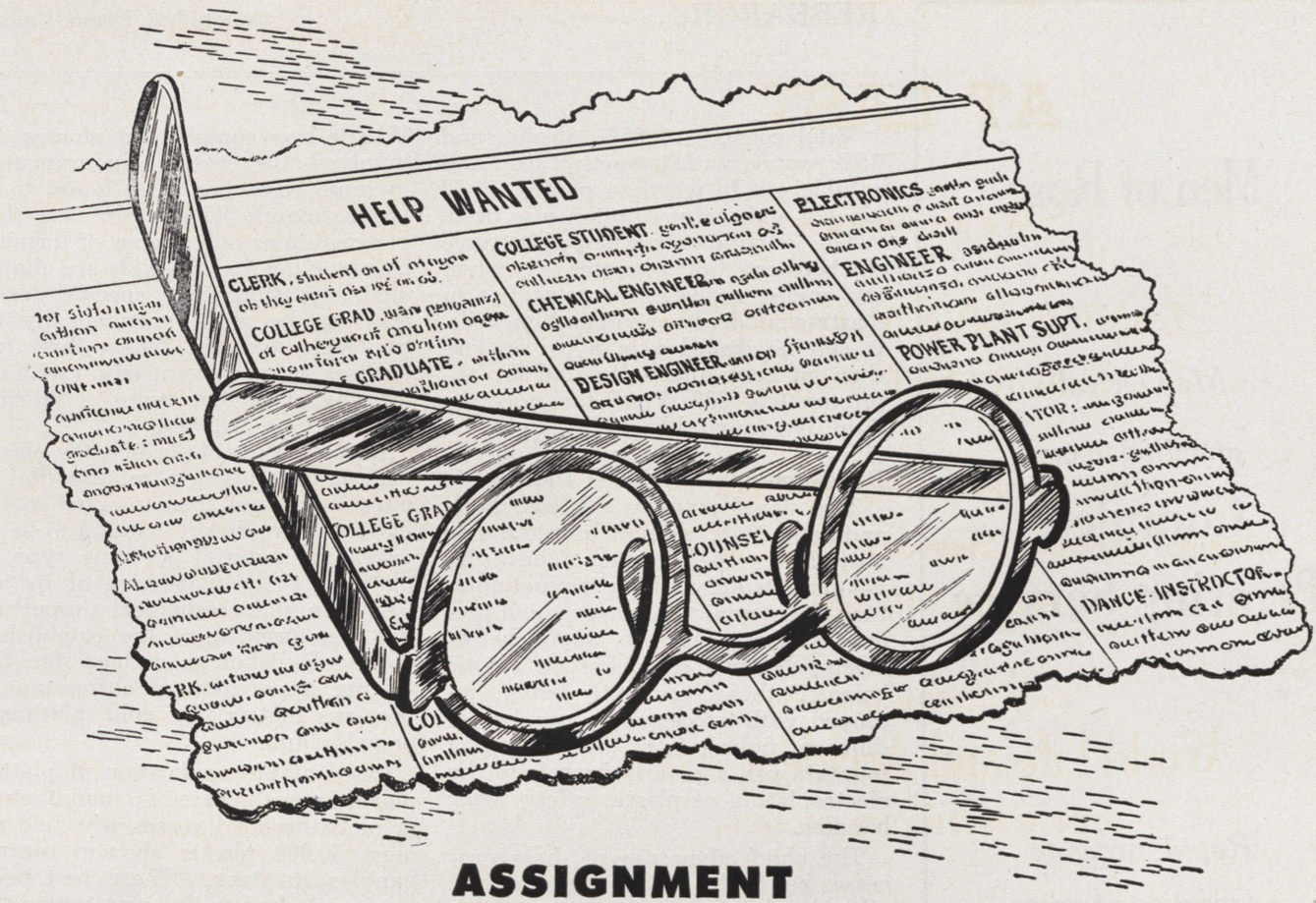
420 LEXINGTON AVENUE, NEW YORK 17, N.Y.

Suspension . . . .

Concluded From Page 24

direction we might take, and that is introducing our freedom *between body and frame*. Here there is the combined mass of engine, transmission (as far as the first universal joint), and frame. Between this mass and the body, freedom might be introduced, though perhaps presenting difficult problems in stability and safety. Already the connection between body and frame has progressed from a canvas separator to rubber mounting with such desirable results as elimination of "road rumble." Further progress with either rubber or springs is surely reasonable.

As Professor Den Hartog, of Harvard University, has said, there is no Sperry gyroscope for the automobile. Its problems in both suspension and steering are far from solved, and the room for improvement is immense. Development groups everywhere are concentrating on these problems, and as before, results are surely forthcoming through a realization that the best reason for doing anything a certain way is simply because it works.



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Vitol consists of 85% alcohol and 15% water, with tetraethyl lead and soluble oil. In wartime planes, 50-50 alcohol and water solution was used.

The Vitameter developed to give the booster "shot" operates only when the engine needs extra power, as in starting suddenly or in climbing hills. It can be installed in a car in less than an hour and will retail for approximately $30. Vitol, the injection fluid, is comparable in cost to motor oil.

Developments In Nickel Plating

Two developments, electroforming and deposition, are now bringing new latitudes to the designer. These developments are making it possible to turn out complicated shapes on a production basis and to apply heavy electro-deposits of nickel on plastic bases. Both are currently being employed with success in a number of different fields—from the forming of fountain pen caps and barrels to the electroplating of plastic safety razor handles.

The chief advantage of these processes lies in the greater latitude they offer the designer and engineer, both for decorative items such as fountain pen parts and for a variety of industrial items—the number of which is only beginning to be explored.

Formed shapes can be controlled within tolerances as small as plus or minus 2/10,000 of an inch. There is little limit to the complications in shapes which can be electroformed. Rounds, squares, recesses, undercuts, and other variations can be combined in a single design. Many of these combinations could not be produced economically in any other fashion—even by machining from solid block stock, which, where possible, would involve excessive machining costs. Where less complicated shapes are involved, the cost of electroforming in some cases has been found to be approximately 25 per cent less than die casting or other types of forming, since tooling and die costs are eliminated, variations in a specific design also can be made economically for the same reason. There are few stresses set up in comparison with die forming or similar types of fabrication, such as drawing.

In the plating of plastics, the plastic base is first given a minute film of pure silver and then inserted in the plating tank. Nickel is found to be an excellent material for this type of plating, not only because of its appearance and mechanical properties, but also because of the established value of nickel as a base for the further application of chromium or precious metals like gold, platinum, or palladium.

One notable application of plating plastics was the case of a manufacturer of bathroom fixtures who had almost 50,000 plastic shower control handles in stock. These had been produced during the war when the use of metals for such purposes was restricted. After metals became available again, the public taste—long accustomed to chromium fixtures—insisted upon a return to bright work. By applying a heavy electro-deposit of nickel to these handles and then plating on a layer of chromium, the entire stock was salvaged.

Electroforming and deposition offer almost unlimited possibilities to the designer, and it is expected that an equal number of applications will develop for these processes, since industry is just beginning to explore their possibilities for production problems.

Alpha Tau Omega

Gamma Gamma of Alpha Tau Omega will usher in the Fall term with rushing activities by entertaining guests at an informal party in the first week of the new term. The chapter is a hive of activity, busily engaged in preparing a gala welcome for the returning grads during the weekend of Homecoming festivities. The actives have outlined what they hope is a program which will keep the homecoming celebrants wild-eyed and happy for three days running.

Orchids to grad Karl Hauser and Al Schairbaum for their good work on the Homecoming decorations. Brother Hauser freely gave much of his vacation time for the project.

The chapter and guests were entertained with a hayride on October 2. The racks made their way down the Clay-Vigo county line to the farm of Bill Tingley (Gamma Gamma), where we all enjoyed hot coffee, cocoa, wieners, doughnuts, and marshmallows.

Congrats to Brother Bill Schumann on his marriage during vacation to Miss Louise Fisher, to Brother Tom Price on his marriage to Miss Charlotte Lindley, and to Brother "Flash" Follis, who walked the "last mile" with Miss Mary Ida Lemmons.

We have in our midst two more ATO Sweethearts this month. Brother John DeReamer gave his pin to Miss Shirlee Moon and Miss Rita Gretencord received a pin from Brother Bill Orbaugh. Both candidates are ISTC students.

Plans are in the making for the annual Christmas Formal dance, traditionally the highlight of the chapter's social calendar. It is hoped that this year's Formal will break all records.

Theta Xi

Commencement is here once again and again we must say farewell to many of our brothers. Their leaving is a great loss to us, but their contributions to the fraternity will never be forgotten.

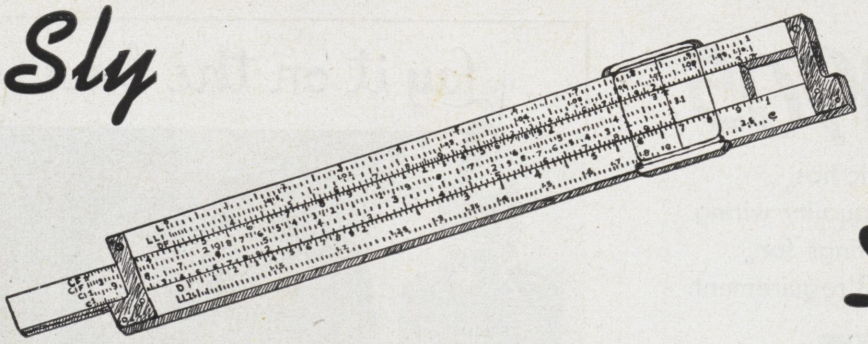
Among those from Theta Xi who are setting forth to face the world with only a slide rule and sheep-skin are: William E. Backes; William G. Blount; Robert L. Brandenburg; John W. Bryant; Charles V. Eshelman; Caspar W. Haupt, Jr.; James Hurt; Max E. Lindley; Richard J. McDaid; Richard S. McFarland; John M. Nevins; Herbert B. Sliger, Jr.; James F. Stieff; and Orville L. Stone.

To these men the chapter extends best of luck in the various tasks they undertake.

On Saturday, October 9, an open house was held with a skating party afterwards. In view of the great number attending it must be said that the party was a great success. Thanks again, Brother Milner, for another enjoyable evening. It should also be said that the picnic near St. Mary's was enjoyed by everyone except maybe Brother Sewell.

The chapter extends its congratulations to Brother and Mrs. Richard McDaid on the birth of a new baby girl.

Sly Droolings



By Robert Campbell, sr., c.e.

According to the chemicals the first alcohol was distilled in Arabia, which may explain those nights.

* * * * *

First Coed: "Jimmy is grand, but I think all men are trying sometimes."

Second Coed: "Men are trying all of the time, dearie."

* * * * *

As far as we know the street sweepers are the only ones to make good following the horses.

* * * * *

The girl was through with her bath and was just stepping onto the scales to weigh herself. Her husband happened to return home at this time and entered through the back door. Seeing what his wife was doing as he passed the bathroom door, he exclaimed, "Well, dear, how many pounds to-day?" Without turning her head, she replied, "I'll take 50 pounds today, and don't you dare pinch me with those tongs."

* * * * *

A group of prohibitionists looking for evidence of the advantage of total abstinence were told of an old man of 102 who had never touched a drop of liquor. So they rushed to his home to get a statement. After propping him up in bed and guiding his feeble hand along the dotted line, they heard a violent disturbance coming from another room — furniture being smashed, dishes being broken and the shuffling of feet.

"Good heavens, what's that?" gasped a committeeman.

"Oh,' whispered the old man as he sank exhaustedly into his pillows, "that's Pa, he's drunk again."

* * * * *

Advice to Younger Men

You can never tell about women —even if you can, you shouldn't.

* * * * *

Chem. Prof: "Can you tell me anything about the great Chemists of the 17th century."

W. Ham (with another timely comment): "They're all dead, sir."

Extracts from a Flapper Diary

First day out—young officer made advances. I repulsed him.

Second day out — young officer made advances, I repulsed him. He threatens to blow up the ship if I repulse him tomorrow.

Third day out — I saved thousands of lives to-day.

* * * * *

A young couple asked the parson to marry them immediately following the Sunday morning service. When the time came, the minister arose and said, "Will those who wish to be united in holy bonds of matrimony please come forward?" There was a great stir as thirteen women and one man approached the altar.

* * * * *

Why aren't you going with Mary any more?"

"Well, she wasn't pretty, she didn't have any money, she wasn't a good dancer, she was a poor conversationalist and she married Joe. So I took the advice of my friends and dropped her."

* * * * *

Engineer's Son: "Daddy, give me a nickel to buy an ice cream cone."

Father: "Shut up, and drink your beer."

A lady bought a parrot from a pet store only to learn that it cursed every time that it said anything. She put up with it as long as she could, but finally one day she lost her patience. "If I ever hear you curse again," she declared, "I'll wring your neck."

A few minutes later she remarked rather casually that it was a nice day. Whereupon the parrot promptly said, "It's a hell of a fine day."

The lady immediately seized the parrot by his head and spun him around in the air until he was almost dead.

"Now then," she said, "it's a fine day to-day, isn't it?"

"Fine day!" exclaimed the parrot. "Where in hell were you when the cyclone struck?"

* * * * *

Overheard in the Bookstore

("Swede" Johnson speaking to impress someone): "I pay for everything that I eat here."

Underclassmen are wanting to know why a job in the bookstore is better than a scholarship.

* * * * *

A lunatic was leaning out of the asylum and watching the gardner.

"What are you doing?" he asked.

"I'm putting manure on the strawberries," the gardner said.

"I usually put sugar on them," replied the lunatic, "but then I'm crazy."

* * * * *

And there was the nervous June bride who didn't know whether to say, "I do," "I have," or "I will."

* * * * *

Foiled

A boy and a girl were out driving. They came to a quiet spot on the country lane and the car stopped. "Out of gas," said the boy. The girl carefully opened her purse and pulled out a bottle. "Wow!" exclaimed the boy, "You've got a whole pint — what kind is it?"

"Gasoline," replied the girl.

Because photography lasts . . .

Little about this scene remains today, yet here you see it as it was. For someone snapped a shutter at the turn of the century—and "filed this record for the future" on film.

Because photography makes records that last, many offices and plants are putting it to profitable use.

By reproducing a drawing, a blueprint, a specification sheet on one of the new Kodagraph Papers, you can have a photographic copy with a sharp, non-fading image of every detail.

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AND TO KEEP PACE WITH THE EVER-INCREASING DEMAND

Chesterfield is building another factory

– it's large – it's modern and in the very heart of Tobaccoland where the Chesterfield Factory group and tobacco-ageing warehouses are already "A city within a city"

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